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SOME HITHERTO UNDESCRIBED OUTCROPS OF ALTAMAHA GRIT AND THEIR VEGETATION

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In my phytogeographical sketch of the Altamaha Grit region of Georgia,* as well as in some earlier papers more accessible to botanists,† I have called attention to the very limited occurrence in the Georgia pine-barrens of outcrops of a kind of rock which is not exactly matched in any adjoining state. These rocks have comparatively little interest for the geologist, being merely a locally indurated phase of a formation of mottled clays and cross-bedded sands which occurs just beneath the superficial Lafayette loam and seems to cover the greater part of the coastal plain from South Carolina to Florida and Mississippi, if not farther; but to the phytogeographer they are extremely significant.

The vegetative covering of any of these rock outcrops can usually be divided into three classes: first, species more common in other habitats in the pine-barren region, which have gained a foothold on the rocks and manage to survive amid uncongenial surroundings because competition is not very severe there; second, species which are common on flat granite or sandstone rocks in the upper districts but are not known elsewhere in the coastal plain; third, a few species not known outside of the Altamaha Grit region of Georgia, which are nearly if not quite confined to these particular rocks.

* Ann. N. Y. Acad. Sci. 17: 22, 41-44. *pl. 1.* 1906.

† *Torreya* 4: 139, 140. 1904; *Fern Bull.* 13: 3, 15. 1905. *Bull. Torrey Club* 32: 143-145, 152, 166, 168, 170. 1905.

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In July, 1906, while spending a few days in South Georgia, I made it a point to visit some of these outcrops of Altamaha Grit which I had heard of in previous years but had never seen; and I was fortunate in adding the names of some species to each of the three classes mentioned above, besides discovering new stations for several plants already known from such habitats.



FIGURE 1. Falls on Rocky Creek, Coffee County, viewed from below. July 18, 1906. (This place is popularly known throughout the county as "The Rocks" or "Falling Water.") The rocky slope in the left foreground is practically bare of vegetation, but on the level surface a few yards farther to the left are most of the rock-loving plants mentioned herein. The trees in the background are mostly *Pinus palustris*.

In the northern part of Coffee County, about nine miles north-east of Broxton, the nearest town of any size, a small creek, known appropriately as Rocky Creek, breaks through a horizontal stratum of Altamaha Grit, tumbles eight or ten feet into a pool, then flows away through a winding gorge 50 to 75 feet wide with perpendicular or overhanging walls. These walls are intersected in places by straight vertical fissures—some of them

wide enough to walk through—where large masses of rock have become detached from the main ledge. In these gloomy crevices, the walls of which are moist in many places from dripping water, are numerous bryophytes (mostly common species) and a few ferns, much as in the “rock-houses” of northern Alabama, described by Dr. Mohr.* In fact the whole appearance of the place, barring its surroundings of open pine-barrens, is much like that of some places in the sandstone plateaus of Alabama with which I had recently become acquainted, and this similarity extends also to the flora, there being not a few species in common.

Down in the gorge the vegetation is very similar to that of river-bluffs in the same region,† while on the broad exposed horizontal ledges on either side were the usual plants of such places, including *Senecio tomentosus*, *Chondrophora virgata*, *Pentstemon dissectus*, *Ilysanthes refracta*, *Crotonopsis*, *Talinum*, and *Selaginella acanthonota* (or a closely related form ‡), which I had not found in Coffee County before. In addition to these, *Stenophyllus capillaris* on the flat rocks was new to the flora of the Altamaha Grit region, and *Cheilanthes lanosa*, on the cliffs, had never been seen in the coastal plain before. *Epidendrum conopseum* in full bloom on the cliffs was another surprise, for I had never before found it on anything but a smooth-barked tree, and rarely on any other tree than *Magnolia grandiflora*, none of which was in sight at this place.

The occurrence of *Cheilanthes lanosa* here furnishes an interesting problem in distribution. The nearest other stations known for it are on granite rocks over 100 miles away, § and there is little likelihood that there is another such place in South Georgia, so one is compelled to believe that its spores have traveled a hundred miles in one leap. Some of the other plants having a similarly disjointed distribution may possibly have grown in many places in the sandy pine-barrens for a time after the region last emerged from the sea and when competition was not so severe

* Contr. U. S. Nat. Herb. 6: 75, 76. 1901.

† See Ann. N. Y. Acad. Sci. 17: 102-106. 1906.

‡ See Bull. Torrey Club 32: 152. 1905; Ann. N. Y. Acad. Sci. 17: 309. 1906.

§ See Fern Bull. 13: 10. 1905; where it is called *C. vestita*.

as at present, but it is inconceivable that the *Cheilanthes* ever did so.

In May of this year I received from Mr. S. W. McCallie, assistant state geologist of Georgia, some specimens of *Diamorpha pusilla* collected on a flat outcrop of this rock in the southeastern part of Washington County, and on July 20th I sought out and found the locality, with most gratifying results. In open pine-barrens between the stations of Peacocks and Harrison I found one flat rock covering about an acre, as well as several smaller ones, all of which strikingly resembled some of the flat granite rocks around Athens, Stone Mountain, and other places in Middle Georgia.* No projecting ledges or cliffs were seen at these places, and the rock stratum is probably pretty thin.

On these flat rocks were observed *Senecio tomentosus*, *Marshallia ramosa*, *Aster squarrosus*, *Chondrophora virgata*, *Ilysanthes refracta*, *Trachelospermum difforme*, *Crotonopsis linearis*, *Arenaria brevifolia*, *Talinum teretifolium*, *Allium Cuthbertii*, *Rynchospora cymosa* and *Scлагinella acanthonota*, each of which was already known from one or more localities in the Altamaha Grit region, but had not been seen in Washington County before.† I found also at the same places *Scricocarpus linifolius* and *Acerates floridana*, new to the Altamaha Grit region but not to the coastal plain, *Kuciffia* sp. and *Diamorpha pusilla*, new to the coastal plain, and a species of *Cuscuta*, probably new to science. Unlike all other known species of *Cuscuta*, this one grew exclusively on one of the most characteristic plants of such situations, *Chondrophora virgata*, which of course (as it has been seen by so few botanists) has never had any such parasite reported from it before. The *Cuscuta* was quite plentiful, but I could not find a trace of it on any other host.

A little later in the day I saw a similar rock outcrop just out-

* For an excellent illustration of such a flat granite area see Bull. Geol. Surv. Ga. 9A: pl. 17. f. 1. 1902.

† For a summary of the previously known distribution of these species within the region, see the catalogue of species (pages 132-322) in my phytogeographical sketch. Notes on the occurrence of some of them in the mountains of Alabama were published in TORREYA for June, 1906, and there is a note on *Trachelospermum* in Bull. Torrey Club 33: 535. 1906.

side of Wrightsville, but being on a moving train at the time I was able to recognize only two species there, *Talinum* and *Selaginella acanthonota*, both of which were new to Johnson County. I have no doubt, however, that *Chondrophora virgata* and several of the other species above mentioned can be found there also.

The fact that the Washington County rock areas are within 30 miles of the fall-line suggests a route by which some of the rock-loving plants may have entered the coastal plain. At the time of preparing my description of the region I had no definite knowledge of the occurrence of this rock so far inland, and did not allow for it on the map. This must be about its extreme inland limit, however, for along the Central R. R., which crosses the county a few miles farther inland, there seems to be no rock of this kind, nor even any pine-barrens. The locality described is just about on the divide between the Ogeechee and Oconee rivers, so it has not been eroded as much as the country a little east and west of it.

The topography of this extreme northern edge of the Altamaha Grit region is not exactly typical, and it seems likely that the more homogeneous lower phase of the formation, which is exposed along the rivers farther south * and perhaps determines the typical topography which has been described elsewhere, † is wanting here, allowing the underlying Oligocene or Eocene rocks to approach the surface. More field work is needed for the determination of this point. An interesting and perhaps correlated fact is that this seems to be the only part of the Altamaha Grit region which is outside of the range of *Pinus Elliottii*, the inland limit of which passes through Johnson County a few miles southeast of Wrightsville.

Up to the present time I have seen unmistakable outcrops of the Altamaha Grit in the counties of Jenkins, ‡§ Washington, Johnson, Tattnall, Toombs, ‡ Laurens, § Dodge, Jeff Davis, ‡§ Coffee, Wilcox, Crisp, ‡ and Turner, ‡§ and have been reliably in-

* See Ann. N. Y. Acad. Sci. 17: 22. 1906; Torrey 6: 199. 1906.

† Bull. Torrey Club 32: 146. 1905; Ann. N. Y. Acad. Sci. 17: 23. 1906.

‡ These five counties are among those created in 1905 and therefore do not yet appear on most maps.

§ In these counties I have seen the rocks only from trains and have not been able to make any notes on their vegetation.

formed of its occurrence in Emanuel, Irwin, Ware, and Colquitt. I am still of the opinion, however, that the aggregate area of all these outcrops will not exceed one square mile or one hundredth of one per cent. of the area of the typical Altamaha, Grit region, as I estimated last year. *

COLLEGE POINT, N. Y.

LEAF-RAFTS AND FOSSIL LEAVES

BY EDWARD W. BERRY

In these modern days, with the dredging of our rivers and estuaries, the draining of our marshes and the ever-widening dumps of refuse that haunt the outskirts of our growing cities, it would seem almost as if the old-time methods by which the vegetation of bygone geological ages was preserved had become a thing of the past, and that the localities where the leaves of the present flora would stand a chance of preservation and fossilization had been usurped by the ever-spreading "white man's burden." Nevertheless, in many a more remote region, leaves, fruits and seeds are being stored away with a prodigality rivaling that of the Mid-Cretaceous or of the European Oligocene.

We are doubtless familiar with accounts of the vast rafts of vegetation which the Amazon and other tropical rivers bring down to the sea; however, these are largely driftwood like the famous Atchafalaya raft in the Mississippi, which by rough computation contained 295 million cubic feet of material and required the intervention of the state for its removal. Similar instances in more temperate climes are rarer, at least so runs the record, and I do not recall any published observations on the leaf-rafts which may be seen on the rivers of our southern coastal plain. These rafts are sometimes of comparatively large size, especially during spring freshets, at which time it is not uncommon to see them from ten to fifteen feet in diameter.

The rivers where they have been observed by the writer are the

* See *Torrey* 5 : 114. 1905 ; *Science* II. 21 : 920. 1905 ; 23 : 486. 1906.